

SCIENTIFIC SERIALS.

Studies from the Johns Hopkins University Biological Laboratory, vol. iv., No. 7, October 1890, contains:—Notes on the anatomy of *Sipunculus gouldi*, Pourtales, by E. L. A. Andrews (plates xlv. to xlvii.). The very detailed anatomical account is prefaced by an interesting history of the habits of this little sipunculoid, which is very abundant at Wood's Holl, Mass. Comparisons are instituted between the author's accounts of this species and those by Andree on *Sipunculus nudus* and by Shipley on *Phymosoma varians*.—On the relationships of Arthropods, by H. T. Fernald (plates xlviii. to l.). Though in working on the problem of the phylogeny of the Arthropods, much labour has been bestowed on the anatomy of the Crustacea, Arachnids, and on *Limulus* and *Peripatus*, next to nothing has been done among the Hexapods and Myriapods. Among the Thysanura, the section containing *Campodea*, *Iapyx*, *Lepisma*, &c., is now well known; but for the anatomy and histology of the Collembola the author knew of only Sommer's article on *Macrotona plumbea*, he therefore has devoted himself to a patient investigation of *Anurida maritima*, and from this standpoint he considers the existing views of the relationships of Arthropods, which are passed in review and commented upon.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 5.—“Preliminary Notice of a New Form of Excretory Organs in an Oligochaetous Annelid.” By Frank E. Beddard, M.A., Prosector of the Zoological Society. Communicated by Prof. E. Ray Lankester, M.A., LL.D., F.R.S.

So far as our knowledge of the Oligochaeta goes at present, the excretory system appears to consist either of one or more pairs of separate nephridia in each segment, or of a diffuse, irregularly arranged system of tubules with numerous external pores upon each segment, and often with numerous coelomic funnels in each segment; there may or may not be a connection between the tubes of successive segments. All the aquatic Oligochaeta have nephridia of the first kind; a large number of the terrestrial Oligochaeta have nephridia of the second kind; there is occasionally in the latter forms a specialization of part of the diffuse nephridial system into a pair of large nephridia; these species connect the two extremes. But in all these worms the nephridia are contained in the coelom, though some of the connecting branches may be retroperitoneal; the ducts which lead to the exterior may branch in the thickness of the body wall, but there does not seem to be any extensive ramification and anastomosis of the tubes in the muscular layers of the body wall (*Quart. Journ. Micr. Sci.*, vol. xxviii., Pl. xxx., Fig. 1, *n*, and Fig. 2).

I have recently found a remarkably different arrangement of the nephridia in an Annelid belonging to a new genus of Eudrilidae. This family is chiefly noteworthy on account of the remarkable modifications of the reproductive organs, and the present genus is no exception to the rule in that particular; but it shows a further peculiarity—in the structure of the nephridia; the arrangement of these organs in the clitellar region of the body is unique among Annelids, and is to a certain extent suggestive of the condition of the organs supposed to be nephridia in certain Nematodea. Throughout the body generally, as in other Eudrilids, the nephridia are paired; in the genital region I was struck, on dissecting the worms, by the apparent absence of nephridia. Sections through the body wall in this region show that the longitudinal and transverse muscular layers are traversed by a system of peculiar canals not at all like nephridia in appearance. These canals are not mere clefts between the muscular fibres, such as Kükenthal has described in his paper “Ueber die Lymphoidzellen der Anneliden” (*Jenaische Zeitschr. f. Naturw.*, vol. xviii., 1885, p. 319); such lymph spaces I have found in a good many Oligochaeta, but they never possess a definite wall. On the contrary, the canals which I describe here have a definite darkly-staining wall, with nuclei here and there. They resemble the blood-vessels very closely, and might easily be confounded with them.

These vessels are arranged in a longitudinal and a transverse series with numerous branches and interconnections. The longitudinal muscles are embedded in a nearly homogeneous, transparent, connective tissue, which is of some thickness between the peritoneal epithelium and where the muscular fibres end. It is in the latter tract of tissue that the four principal

longitudinal trunks run, corresponding in position to a line connecting the four successive pairs of setae; there appear to be smaller longitudinal trunks, but the four principal ones run through several segments without a break; these longitudinal trunks are connected with a metamerically repeated system of transverse vessels; these lie between the transverse and longitudinal muscular coats, and appear to run right round the body. They are of considerable calibre, but not so wide as the longitudinal trunks; I could not detect any ciliation anywhere, and their walls are extremely thin. They give off numerous branches, which traverse the body wall in every direction, and form a finer meshwork of tubules; some of the branches run towards the epidermis, and although I could not detect in transverse sections the actual orifices, on account of the fineness of the tubes, I could make out at frequent points a slight modification of the epidermis which seemed to correspond to an external pore.

Upon fragments of the chitinous cuticle being stripped off and examined with a high magnifying power, the orifices were quite plain. They were much smaller than the nephridiopores of *Perichæta*, but not so minute as to be confounded with the pores of the gland cells of the epidermis.

The system of tubes was everywhere accompanied by blood-vessels; but, it is perhaps unnecessary to remark, there was nowhere any connection between these tubes and the capillaries; no coagulated blood was in a single instance found in the excretory tubules.

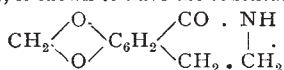
In spite of their very different appearance, as well as arrangement, from the nephridia of other types, such as *Perichæta*, which possess a diffuse nephridial system, the excretory nature of these tubes seems probable, without any further description. A connection with the body cavity must be proved in order to remove all doubts as to their nature; in each segment, just behind the pair of setae, the longitudinal duct gives off a branch, which passes through the peritoneum and comes to lie in the coelom; this branch continues for a short distance, and then abruptly ceases; whether it is furnished with an actual orifice or not I am unable to say. In a few cases, the branch entering the coelom became connected with a very small coiled nephridial tubule, so small that it was not, as already mentioned, recognizable in dissection.

I am inclined to refer the atrophy of the intra-coelomic part of the nephridia to their having been used up in the formation of the genital ducts. I have recently communicated to this Society a notice of the development of the genital ducts out of nephridia in *Acanthodrilus* (“Roy. Soc. Proc.,” vol. xlviii., 1891, p. 452); and that mode of development is possibly general. In any case the nephridial system of the genital segments of this *Eudrilid* consists almost entirely of a complex system of tubes, which ramify in the thickness of the body wall, which open by numerous pores on to the exterior, and are connected by a few short tubes with the body cavity. If the tubes leading to the coelom became obliterated, and they are very short as it is, the excretory system would consist only of the network in the body walls.

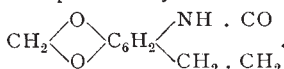
This system of tubes in the skin may perhaps be more comparable to the nephridial network of Cestodes and other flat Worms, than the intracoelomic network of other Oligochaeta; its presence, however, in the body walls suggests a comparison with the Nematodea, which appear to possess at least the remains of a coelom. In some of these Worms a system of fine tubes connected with the excretory pore permeates the interspaces between the longitudinal muscles. In *Echinorhynchus* the tubes connected with the lemnisci also ramify in the integument, and the lemnisci themselves are processes of the body wall depending into the coelom.

Chemical Society, February 19.—Dr. W. J. Russell, F.R.S., President, in the chair.—The following papers were read:—The action of reducing agents on *αα*-diacetylpentane: synthesis of dimethyldihydroxyheptamethylene, by F. Stanley Kipping and W. H. Perkin, Jun., F.R.S. On reducing *αα*-diacetylpentane dissolved in moist ether with sodium, it is converted into a colourless liquid of the composition $C_8H_{18}O_2$. This compound is formed by the addition of two atoms of hydrogen to diacetylpentane, and from its behaviour the authors conclude that it is *dimethyldihydroxyheptamethylene*. The authors also describe the properties and some derivatives of this reduction product.—The osmotic pressures of salts in solution, by R. H. Adie. The osmotic pressures were determined by direct observation by the method of Pfeffer. The results are arranged under the following five headings:—(1) *Boyle's law, applied to solutions*. The results show that the osmotic pressures

do not vary directly as the concentration, and when represented graphically give a definite curved form, approaching Ostwald's line of no dissociation at two points, and receding from it elsewhere. Potash alum gives the nearest approach to a straight line of the salts examined. (2) *Charles's law, applied to solutions.* Only one experiment yielded any result, and that was confirmatory of the correctness of applying Charles's law to solutions. (3) *Influence of bases on osmotic pressures.* No definite influence can be attributed to the base, except that the salts of some bases, *e.g.* soda, appear to be more readily dissociated by water than those of others, *e.g.* potash. (4) *Influence of acids on osmotic pressures.* In the case of inorganic acids no definite influence can be detected. In the case of organic acids, an increase in molecular weight of homologous acids increases the osmotic pressure, and a ring nucleus gives a higher osmotic pressure than an open chain. (5) *Avogadro's law, applied to salts in solution.* The author suggests that the differences between the observed results and those calculated on the assumption that Avogadro's law applies to salts in solution, may be due to the existence of simple and complex molecules, as well as to the formation of water compounds.—A direct comparison of the physical constants involved in the determination of molecular weights by Raoult's method, by R. H. Adie. The author shows that the constants of Raoult's method of determining molecular weights, and those ascertained by direct observation of the osmotic pressure do not agree. An attempt is also made to connect, by the same method of Raoult, the osmotic pressure with the gaseous pressure of any substance in solution.—Derivatives of piperonyl, by Frederick M. Perkin. The compound $C_{10}H_9NO_3$, obtained from berberine by the author's brother, is shown to have the constitution



The author also describes the preparation from piperonal of the isomeric compound represented by the formula



—Studies on the constitution of tri-derivatives of naphthalene; No. 9, Andresen's β -naphthylaminedisulphonic acid, by Henry E. Armstrong and W. P. Wynne. The authors have examined the acids obtained by reduction of the products of nitration of naphthalene-1 : 3'-disulphonic acid. The chief product on reduction gives the so-called α -naphthylamine- ϵ -disulphonic acid [$\text{NH}_2 : \text{SO}_3\text{H} : \text{SO}_3\text{H} = 1' : 1 : 3'$]. Of the other products, one on reduction yields a β -naphthylaminedisulphonic acid [$\text{NH}_2 : \text{SO}_3\text{H} : \text{SO}_3\text{H} = 2 : 4 : 2'$] (Andresen's acid). This is the first instance in which the formation of a β -nitro-acid by the nitration of a naphthalenesulphonic acid has been observed.

Physical Society, February 27.—Prof. W. E. Ayrton, F.R.S., President, in the chair.—The following communications were read:—Proof of the generality of certain formulæ published for a special case by Mr. Blakesley; tests of a transformer, by Prof. W. E. Ayrton, F.R.S., and Mr. J. F. Taylor. In 1888 Mr. Blakesley published a number of formulæ relating to the measurement of power, &c., in alternating current circuits by means of electro-dynamometers, one of which had its two coils independent, and placed in different circuits. These formulæ were deduced on certain assumptions, the chief ones being that the currents and magnetizations varied harmonically, and that the magnetic stress in the iron was proportional to the ampere-turns. The present paper shows that the above assumptions are not necessary to the truth of the resulting formulæ. To take the case of a transformer, let alternating current ammeters be placed in the primary and secondary circuits, and a direct-reading "split dynamometer" have a coil in each circuit. Let D_p , D_s , and D_{ps} be the respective readings of these instruments, then, whatever be the law of variation of the currents,

$$D_p = \sqrt{\frac{1}{T} \int_0^T A_p^2 dt}$$

$$D_s = \sqrt{\frac{1}{T} \int_0^T A_s^2 dt}$$

and

$$D_{ps} = \sqrt{\frac{1}{T} \int_0^T A_p A_s dt},$$

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where A_p and A_s are the values of the primary and secondary currents at any instant, and T the time of one complete alternation. If i be the total induction in the core, P and S the numbers of turns of wire on the primary and secondary respectively, V_p and V_s the terminal pressures, ρ the resistance of the primary coil, and s the resistance of the whole secondary circuit, then the following equations hold at any instant—

$$V_p = \rho A_p + P \frac{di}{dt}$$

$$\frac{di}{dt} = \frac{s}{S} A_s.$$

Therefore

$$V_p = \rho A_p + \frac{P}{S} s A_s.$$

Multiplying both sides by A_p , we get

$$A_p V_p = \rho A_p^2 + \frac{P}{S} s A_p A_s,$$

and integrating from $t = 0$ to $t = T$, and taking the mean,

$$\frac{1}{T} \int_0^T A_p V_p dt = \frac{\rho}{T} \int_0^T A_p^2 dt + \frac{P}{S} \frac{s}{T} \int_0^T A_p A_s dt;$$

or

$$\text{watts in primary} = \rho D_p^2 + \frac{P}{S} s D_{ps}.$$

quite independent of the laws of variation of A and V . The power lost in heating the iron core was also shown to be

$$s \left(\frac{P}{S} D_{ps} - D_p^2 \right)$$

Other formulæ, such as that given by Mr. Blakesley, expressing the primary volts in terms of the dynamometer readings, are shown to be true generally. On the subject of transformer magnetizations, the authors state that it is desirable not to speak merely of the ampere-turns, but also of the self-induction, for they have reason to believe that the magnetizing value of an ampere-turn varies. Defining the self-induction of the secondary by the equation

$$L_s = \frac{dN}{dA_s},$$

N being the total flux through the secondary, they show geometrically (assuming harmonic variations) that if L_s diminishes, the efficiency increases, and at the same time the phase angle θ between the primary and secondary currents, and the magnetic lag ϕ , decrease. On comparing this theoretical deduction with the results of experiment, they find a good agreement, as will be seen from the following table:—

Frequency.	Efficiency.	L_s	θ	ϕ
	Per cent.			
160 ...	96.3 ...	0.0017 ...	113 ...	0 24
160 ...	92 ...	0.0368 ...	169 ...	18 24
160 ...	85.4 ...	0.1241 ...	174.6 ...	45 36

Similar results were obtained in different sets of experiments. It was also noticed that, as the secondary current is increased, the efficiency rises to a maximum and then diminishes, whilst L_s , θ , and ϕ diminish and then rise again, the current which gives the maximum efficiency coinciding almost exactly with that which gives minimum values to L_s , θ , and ϕ . The methods employed in making the tests are described in the paper, and the formulæ used in working out the results are there demonstrated. Amongst the facts deducible from the experiments are the following: (1) with constant frequency, the ratios $\frac{V_s}{V_p}$ and $\frac{D_s}{D_p}$ increase as the primary volts rise; (2) with frequency constant and primary volts constant, $\frac{V_s}{V_p}$ decreases, and $\frac{D_s}{D_p}$ increases

as the secondary current increases; (3) with constant secondary current, L_s decreases as the primary volts are increased; (4) with small constant secondary currents, the efficiency diminishes as the frequency increases; (5) for large secondary currents the efficiency is approximately independent of the frequency; (6) shunting the secondary with a condenser increases the efficiency. The transformer in which the above tests were made was one of the Mordey type kindly lent by the Brush Electric Engineering Corporation.—

Further contributions to dynamometry, by Mr. T. H. Blakesley. The object of Mr. Blakesley's paper was, in the first place, to show what sort of physical quantities could be advantageously evaluated by using electro-dynamometers of two coils of low resistance in circuits conveying electric currents. The meaning of a dynamometer reading was explained to be the mean value of the product of two currents, either steady or undergoing any periodic variations with sufficient rapidity. In mathematical

language such an instrument measured $\frac{1}{T} \int_0^T C_1 C_2 dt$, where C_1 and C_2 were the instantaneous values of the currents in the two coils, including, of course, the common case where these currents are identical. Any physical quantity whose value was such a product $C_1 C_2$ multiplied into something which was independent of the time, and which, therefore, on integration, came outside the integrator, was well adapted to have its mean value given by such instruments. Power was such a quantity, being merely (current)² $\times$ resistance. The square of an E.M.F. was another such quantity, but he did not wish to restrict the method to such evaluations. It follows that any quantity whose instantaneous value can be expressed by terms each quadratic in current, and whose other factor was independent of time, could have its mean value expressed in dynamometer readings. In addition, the particular place and mode of coupling of the dynamometers was indicated by the instantaneous equation, as well as the factor to be applied to each reading. Thus the equations are made to indicate the practical arrangement to be adopted, and the use to be made of the observations in each case. Examples were given for the cases of transformers in series and parallel, and special applications of the method were suggested in the measurement of the power employed in such diverse apparatus as voltmeters subject to direct or variable currents of any sort, welding machines, parallel generators, tuning-fork circuits, vacuum discharges, and imperfect condensers. For parallel generators the power of each could be separately estimated, and in the case of electric welders, the power employed in the welding circuit was shown to be measurable without introducing any resistance whatever into that circuit. Mr. J. Swinburne said the author's assumption that there is no back or forward E.M.F. in the primary and secondary circuits of transformers except that due to $\frac{di}{dt}$, where i is the total induction in the core, was

unwarrantable, for in all real transformers there was a "drop" due to waste field, and this made the split dynamometer method useless. It makes the full load efficiencies too high, and this, he thought, accounted for the extraordinary results obtained by Prof. Ayrton and Mr. Taylor. If a dynamometer be used at all, it should, he said, be used as a wattmeter, the moving coil of one turn being joined in series with a non-inductive resistance and put as a shunt to the primary. The power absorbed by the instrument itself should be then determined, and the power given out by the secondary measured by the same instrument, if the secondary be not non-inductive. Any errors due to self-induction in a wattmeter are, he said, equally present when it is called a split dynamometer, and in addition to this the wattmeter as a split dynamometer precludes the possibility of measuring power. Mr. Mordey said the results obtained by Prof. Ayrton and Mr. Taylor confirmed experiments he had made himself by an entirely different method, for he found that the losses in the iron decreased considerably as the secondary current increased, and this gave increased efficiency. In his experiments he kept the load constant until the transformer attained a steady temperature, and then substituted a direct current for the alternating one, varying its strength until the same steady temperature was maintained. The power thus supplied is a measure of the loss in the transformer under the working condition. A 6 kilowatt transformer tested by this method gave a loss of 110 watts at no load, and at full load 205. Of this 205, 176 was accounted for by the loss in the copper coils, leaving only 29 watts as the iron losses at full load. Figures which he quoted from Prof. Ayrton and Mr. Taylor's paper showed the same general result.—A note on electrostatic wattmeters, by Mr. J. Swinburne, and a paper on Interference with alternating currents, by Prof. W. E. Ayrton, F.R.S., and Dr. Sumpner, were postponed.

Linnean Society, February 19.—Prof. Stewart, President, in the chair.—Mr. Thomas Christy exhibited a number of food nuts utilized by the natives of Northern Queensland, and gave the native names for them. The species,

however, had not been determined, since no flowers nor foliage of the trees producing them had been obtained.—On behalf of Mr. A. K. Hunt, the Secretary exhibited a curiosity in the shape of an orange within an orange, and remarked that, although by no means of common occurrence, a similar abnormality had been described and figured by Dr. Perrier (*Bull. Soc. Linn. Normand.*, ix. tab. 2).—Mr. G. C. Druce gave an account of the Dillenian Herbarium at Oxford, prefacing his remarks with some particulars of Dillenius's life and labours, and of the botanists of his day with whom he was in correspondence.—Prof. Stewart exhibited and described a remarkable hermaphrodite trout, explaining, by means of the blackboard, the normal structure of the genital organs in both sexes of the fish, and pointing out in what respects the specimen in question differed.—A paper was then read by Dr. John Lowe, on some points in the life-history and rate of growth in yew-trees, and some excellent photographs and drawings of celebrated yews were shown in illustration of his remarks.

Zoological Society, March 3.—Prof. Flower, F.R.S., President, in the chair.—The Secretary read a report on the additions that had been made to the Society's Menagerie during the month of February 1891.—Mr. Sclater exhibited the typical and unique specimen of Macgregor's Bower-bird (*Cnemophilus macgregorii*) from the Queensland Museum, Brisbane, which had been kindly lent to him by the authorities of that institution.—A report was read, drawn up by Mr. A. Thomson, the Society's head keeper, on the insects bred in the insect-house during the past season.—Mr. O. Thomas gave an account of a collection of small Mammalia made by Mr. F. J. Jackson in Eastern Central Africa during his recent expedition through the territories of the British Imperial East African Company. Fifteen species were represented in the collection, of which three appeared to be new to science. These were named *Nyctinomus lobatus*, *Otomys jacksoni*, and *Rhizomys annectens*.—A communication was read from Miss E. M. Sharpe on the Butterflies collected by Mr. F. J. Jackson during the same expedition. Twelve new species were described in this paper, and a general account of the whole collection was promised on a future occasion.—A communication was read from Dr. R. W. Shufeldt, containing observations on the comparative osteology of the Columbidae of North America.

Mathematical Society, March 12.—Prof. Greenhill, F.R.S., President, in the chair.—Dr. Hirst, F.R.S., drew the attention of the members present to the loss the mathematical world had sustained by the recent death of Madame Sophie Kovalevsky (see NATURE, February 19, p. 375), and gave many personal reminiscences. The President also touched upon some of her mathematical work.—The following papers were communicated:—On cusp-loci, which are enveloped by the tangents at the cusps, by Prof. M. J. M. Hill.—On the partitions of a polygon, by Prof. Cayley, F.R.S.—Some theorems concerning groups of totitives of n , by Prof. Lloyd Tanner.—Mr. Love and Prof. Hill spoke at some length on four theorems, connected with the motion of a liquid ellipsoid under its own attraction, more particularly concerning the surfaces which always contain the same particles.—Dr. Larmor made an impromptu communication on the collision of two spherical bodies with reference to Newton's experiments.

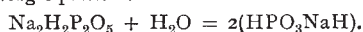
EDINBURGH.

Royal Society, February 16.—A. Forbes Irvine, Vice-President, in the chair.—Prof. Tait read a further note on the virial. In a former communication he deduced from the expression for the virial a general equation connecting the pressure, volume, and temperature of a substance, and also gave numerical values of the constants in the equation which enabled it to roughly represent the isothermals of carbonic acid. In the present note he gives values of the constants which enable the equation to represent these isothermals with great accuracy in the neighbourhood of the critical point.—Dr. Berry Haycraft discussed the adverse criticism of Salkowski and Jolin regarding his process for the estimation of uric acid. He also reviewed the favourable notices of Hermann, Czapek, and Camerer. He showed that the results obtained by the methods of Salkowski and Jolin cannot be accepted in disproof of the utility of his method.—Dr. Haycraft also described a method for the determination of the density of a liquid, when only small quantities of it can be obtained. A drop of the liquid is placed in another liquid of greater density than it, and a liquid of less density is added until

the drop will neither float to the surface nor fall to the bottom of the mixture.—Prof. Tait communicated a paper, by Prof. Cargill G. Knott, on the interaction of longitudinal and circular magnetizations in iron and nickel wires. In a former paper on this subject, Prof. Knott described effects which were observed when a constant current of electricity was made to flow along a wire which was subjected to a cyclical variation of longitudinal magnetization. He has since found that some of the results were due to a slight amount of twist which had been given to the wire previously to its magnetization. A twist of not more than a few minutes of arc per centimetre of length causes a profound modification in the magnitude of the average polarity which is developed in the wire by the cyclical process when the constant current is maintained. The effect of the current is to reduce hysteresis.—Prof. Tait read a paper, by Mr. Robert Brodie, on the value of the method of demonstration by superposition.—Dr. Hugh Marshall described the method of formation of, and exhibited a specimen of, potassium persulphate. The unexpected discovery of the stability of a salt of persulphuric acid is of great theoretical importance.—Dr. John Murray communicated a paper on the temperature of the Clyde sea-area. Among other points, he described the action of an in-shore breeze in summer in accumulating the warm surface-water on the lee shore, and the action of an off-shore breeze in blowing away the warm surface-water from the coast, and thus causing the cold water to rise to the surface. This action is reversed in winter. In one case a variation of temperature of a number of degrees was observed within two days from a reversal in the direction of the wind.

PARIS.

Academy of Sciences, March 9.—M. Duchartre in the chair.—On some experiments made in 1890 at the Aubeis sluice, by M. Anatole de Caligny.—Observation of the asteroid (308) discovered at Nice Observatory on March 5, by M. Charlois. The asteroid is of the 13th magnitude. Its position was R.A. 10h. 1m. 26s., N.P.D. 70° 17' 50", at 8h. 46m. 45s. mean time at Nice on March 5.—Observations of the asteroid (307), made at Toulouse Observatory by MM. Baillaud and Cosserat, and of (308), made by M. Andoyer with the great equatorial. Observations for position were made on March 3, 4, 5, 6, and 7.—Observations of (307) made at Paris Observatory with the East Tower equatorial, by Mdle. Klumpke. Observations for position were made on March 3, 5, and 6.—On the measure of the 52nd parallel in Europe, by M. Vénukoff. In presenting to the Academy "Mémoires de la Section Topographique de l'État-Major Général Russe," vols. xlv. and xlvii. (St. Petersburg, 1891), M. Vénukoff remarked upon the results obtained from the Russian triangulation, and those obtained in England by Clark. The Russian stations give 68°64'12 kilometres as the mean length of a degree of longitude in latitude 52°; the English measures give the value 68°6880. A similar variation is seen if only Russian stations are considered. It appears, therefore, that the terrestrial surface under the 52nd degree of latitude is not that of an ellipsoid of revolution. This conclusion depends, of course, upon the accuracy of the results cited. Measures of the 42nd parallel in the United States lead, however, to a similar conclusion. M. Vénukoff therefore adds that the earth is not a perfect sphere.—On equations of two minimum periodic surfaces possessing the symmetry of an octahedron, by M. A. Schoenflies.—On harmonic spirals, by M. L. Raffy.—On the compatibility of the laws of dispersion and double refraction, by M. G. Carvallo.—Longitudinal and transverse superposed magnetizations, by M. C. Decharme.—On the hydrated manganites of sodium, by M. G. Rousseau. The author treats of the decomposition of potassium permanganate by heat, and of the formation of manganites by heating sodium manganate with sodium chloride.—On the transformation of sodium pyrophosphite into hydrogen sodium phosphite, by M. L. Amat. The solution of sodium pyrophosphite gradually changes according to the following equation:—



The law according to which the transformation takes place is given by

$$\frac{1}{x} \log \frac{l - \phi_0}{l - \phi} = k \log e,$$

where k is a constant, x is the duration of the experiment in

hours, ϕ is volume in c.c.s of standard soda required for neutralization at end of experiment, ϕ_0 = value of ϕ at beginning of experiment, l = limiting value of ϕ when transformation is complete. The experimental values of the constant $k \log e$ vary from 0.000327 to 0.000369. In the presence of very dilute acid (H_2SO_4), $k \log e$ varies from 0.00149 to 0.00122; with stronger acid, and taking x in minutes, $k \log e$ varies from 0.0125 to 0.0059.—On silicobromoform, by M. A. Besson.—A study of the thermochemical properties of some alkaline derivatives of erythrite, by M. de Forcrand.—On some ammoniacal compounds of cyanide of mercury, by M. Raoul Varet.—On the fermentation of starch by the action of the butyric ferment, by M. A. Villiers. The writer claims to have discovered a new carbohydrate, differing from the sugars, and crystallizing from alcohol as



—The histological changes of the skin during measles, by M. Catrin.—On the existence of "attractive spheres" in vegetable cells, by M. Léon Guignard. Some time ago M. van Beneden gave the name *sphères attractives* to certain small bodies playing an important part in the segmentation of the cells of animals. M. Guignard now announces that vegetable tissues show attractive spheres similar to those found in animal tissues. He thinks the bodies merit the name of *sphères directrices*, since they govern the division of the nucleus, and move without discontinuity from one cell to another during the whole life of the plant.—On the classification and history of *Clusia*, by M. J. Vesque. The histological characteristics of those Guttiferae known as *Clusia* are described.—On the chalk of Cotentin, the white Meudon chalk, and the Maestricht tufa, by M. A. de Grossouvre.—Skull of a cave-bear, having traces of a blow inflicted by a flint axe, by M. Wanzel.

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